





NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Delivering ecosystem science solutions to sustain thriving coastal communities and economies

The National Oceanic and Atmospheric Administration (NOAA) formed the National Centers for Coastal Ocean Science (NCCOS) in 1999 as the focal point for NOAA's coastal ocean science efforts. We help NOAA meet its coastal stewardship and management responsibilities, provide coastal managers with the scientific information necessary to decide how best to protect environmental resources and public health, preserve valued habitats, and improve the way communities interact with coastal ecosystems.



NCCOS SCIENCE PRIORITIES

-  Communities need to manage ocean space and coastal resources to support economic, social, and environmental goals. Through marine spatial ecology, we provide maps, models, and assessments to guide communities in managing ocean space and associated coastal resources.
-  Local leaders need to understand the impacts of Harmful Algal Blooms and other hazards. We provide the nation's longest running coastal pollution monitoring and assessment enterprise through our work in stressor impacts and mitigation.
-  As coastal communities respond to a changing climate, we investigate how changes in sea levels, ocean chemistry, and temperature affect coastal ecosystems. Our scientific data and planning tools help communities prepare for, recover from, and adapt to adverse events.
-  Regardless of where they live, Americans depend on the coast for food, economic security, and recreation. Our social science assesses nonmarket values of ecosystem services and documents social and cultural values of coastal resources.

SEAFLOOR MAPS OF NEW YORK WIND ENERGY AREA PUBLISHED

NCCOS published the results of a seafloor characterization study conducted for the Bureau of Ocean Energy Management in support of a \$3 billion wind energy project in New York's offshore waters expected to build 60–80 wind turbines, create 800 local jobs, and power over 500,000 homes. The assessment provides baseline data to help managers better evaluate the potential impacts of offshore wind development, and identify additional potential wind energy sites in the region. The findings verify that the area is primarily sand with little hard bottom, and has limited presence of economically important fish or shellfish, making the area conducive for wind farm infrastructure. The wind energy project furthers New York's objective to generate 50 percent of its electricity from renewable energy by 2030.



NEW HAB TOOLS HELP INFORM AND PROTECT THE PUBLIC

The experimental Florida red tide respiratory forecast—launched by NCCOS and partners in 2018 for Pinellas County—now includes Sanibel Island. The forecast helps beachgoers, especially those with respiratory conditions, know the daily severity of airborne red tide toxins at area beaches. In Lake Erie, NCCOS developed an autonomous sensor capable of measuring algal toxin levels in the lake and transmitting results back to shore in near real-time. These data can give lake managers early warning of a bloom's toxicity and modelers more observations to improve NOAA's harmful algal bloom (HAB) forecasts. Also, NCCOS-funded scientists characterized a naturally occurring and environmentally safe algicidal compound produced by the bacterium *Shewanella*, and confirmed the compound can selectively kill marine dinoflagellates that produce HABs. The team is now testing a delivery method of embedding the bacteria in gel-like beads contained in mesh bags that can be temporarily deployed in coastal waters as needed.

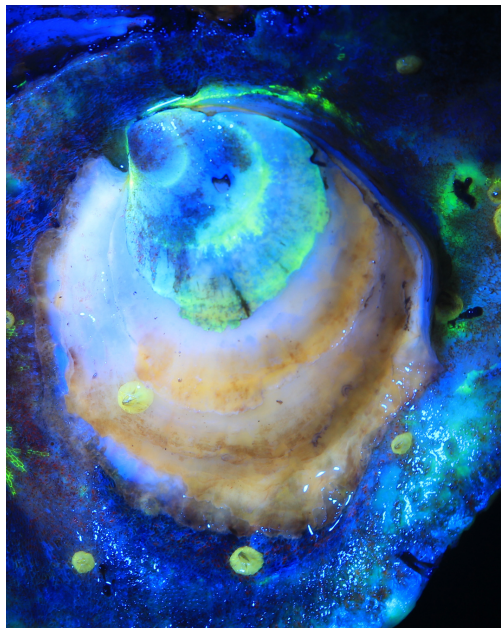
SHORELINE ARMORING DEVALUES ADJACENT, AT-RISK, UNARMORED LAND

NCCOS-funded research in Oregon shows that armoring coastal properties with structures, such as seawalls and rock revetments, to prevent shoreline erosion economically benefits the owners of such properties at the expense of adjacent, at-risk, unarmored properties. The study found that armoring properties eligible for such protection can increase their value, but adjacent properties ineligible for armoring sell for less. Adjacent properties not vulnerable to erosion are not affected either way. To protect beaches from over-development, Oregon prohibits "armoring" private property developed after 1976. An impact of this policy is that armored properties can change sediment flows and redirect waves to erode shoreline at adjacent, unarmored properties.



NEW TOOL HELPS COASTAL LANDOWNERS FIND THE RIGHT LIVING SHORELINE

The NOAA RESTORE Science Program, administered by NCCOS, continues to transform penalty funds from the *Deepwater Horizon* oil spill into findings and products that support better management of the Gulf of Mexico. One project has created an interactive, online tool that allows coastal landowners in the Gulf to get site-specific recommendations on how to protect their property from shoreline erosion and protect coastal resources at the same time with a living shoreline. Living shorelines use native vegetation and natural habitats, such as oyster reefs, to control erosion as an environmentally friendlier alternative to seawalls and bulkheads.



NEW METHODS DEVELOPED FOR OYSTER RESTORATION AND MONITORING

Traditional oyster restoration strategies involve seeding oyster shells with lab harvested oyster larvae in aquariums before placing the seeded shells in their natural habitat. But what if you could release larvae directly onto open water oyster reefs? A new NCCOS study in Chesapeake Bay shows this approach can work, and the technique developed to test the theory also has benefits. The team identified deployed oyster larvae by “tagging” their shells with a fluorescent dye prior to release. The non-toxic dye, approved by the FDA and U.S. Fish and Wildlife Service, glows under special light, and can last many months as oyster larvae settle and grow. Tagging shells will allow oyster farmers, health officials, and enforcement agencies grappling with oyster poachers the ability to identify the origin of oysters.

MAGNITUDE AND EFFECTS OF CONTAMINANTS IN U.S. COASTAL WATERS

NCCOS has conducted contaminant assessments of the nation’s estuaries and bays since the early 1990s. A new report summarizes each of these studies in a standard format, allowing comparisons across locations and regions. The studies assess the distribution, concentration, and toxicity of contaminants in an area, and how those contaminants might impact the diversity and abundance of animals living there. The data inform risk and damage assessments, restoration activities, and serve as a baseline to evaluate change, such as the impact of oil and chemical spills, natural disasters, or development projects.



GUIDELINES FOR MAPPING NEARSHORE SEAFLOOR WITH AERIAL DRONES

Aerial drones, outfitted with cameras and supported with photogrammetry software, may offer an inexpensive and accurate way to map nearshore waters that are difficult to access, generating the imagery and water depth data needed by coastal managers. This year, NCCOS and partners published guidelines for using aerial drones to map the nearshore coastal seafloor. The new report provides the results and analyses from over 100 drone mapping flights along the coasts of California and the U.S. Virgin Islands, evaluating the influence of airframes, sensors, environmental conditions, and processing procedures.

SCIENTISTS SURVEY THUNDER BAY SANCTUARY LAKEBED

NCCOS scientists and their partners surveyed part of the lakebed in Michigan’s Thunder Bay National Marine Sanctuary to support better management of underwater resources in the sanctuary. First, the team surveyed the area with the latest sonar technology. Then, divers returned to the site to verify the acoustically derived data. The researchers are using the data collected on these missions to develop high resolution maps of shipwrecks, invasive mussel distributions, and important fish habitats in the sanctuary. Less than 20 percent of the sanctuary has been mapped using modern sonar technology.

COMPETITIVE RESEARCH PROGRAM CELEBRATES 30 YEARS

The NCCOS Competitive Research Program (CRP) celebrates 30 years of research, monitoring, assessments, and technical assistance to support NOAA's mission. While much has changed from our name and our position in NOAA, our mission has remained constant: Providing groundbreaking and innovative research to support coastal communities.

NOTED ACCOMPLISHMENTS



Through a suite of harmful algal bloom (HAB) programs and regional and targeted studies, CRP has developed innovative tools that prevent, forecast, detect, monitor, control, and mitigate HABs to meet the needs of state, local, tribal managers and industry partners. Mitigation tools around the US pinpoint bloom size and movement, predict HAB severity and alert coastal managers to potential impacts to the environment, public health, and the economy. Ongoing efforts are focused on new HAB control and toxin detection methods and quantifying socioeconomic impacts.



The Effects of Sea Level Rise Program (ESLR) has emerged as a leading science initiative focused on studying impacts of sea level rise to ecosystems, communities, and infrastructure. ESLR provides innovative science products of regional coastal vulnerability and solutions to mitigate flood risk. These products resulted in the first Hawaiian anchialine pool restoration since the 1990's, enabled the City of Apalachicola (FL) to assess vulnerability to flooding, and are informing land purchases for wetland restoration in San Francisco Bay.



The Regional Ecosystem Research program (RER) develops science-based approaches focused on the management of marine protected areas and evaluation of ecosystem stressors. These approaches include raising global awareness about poorly studied mesophotic coral ecosystems—resulting in the expansion of the Pulley Ridge Habitat Area of Particular Concern, protecting an upstream source of fishes for the Florida Keys—and understanding how long-term ecosystem variability influences key indices of ecosystem health and success.



Long-term studies on hypoxia in the Gulf of Mexico and other coastal regions provide the scientific understanding and tools necessary to set management goals and measure progress for reducing the impact of these zones to ecosystems and living resources. Scenario forecasting of hypoxic conditions is the basis for guiding multibillion-dollar state and federal nutrient management programs to reduce hypoxia in the Gulf of Mexico, Chesapeake Bay, Narragansett Bay, and the Great Lakes.

NCCOS FACILITIES



NCCOS Program Office and Headquarters, Silver Spring, MD - Serving as NCCOS headquarters and program office, the Silver Spring location houses administrative functions and scientists who address marine spatial ecology and stressor, impacts, and mitigation. NCCOS appropriations are received from the National Ocean Service "Coastal Science, Assessment, Response and Restoration" and "Competitive Research" budget PPAs.



Cooperative Oxford Laboratory, Oxford, MD - Located on the shores of Chesapeake Bay, the lab was established in 1960 primarily to investigate oyster diseases that struck the region in the late 1950s. The lab has a 55-foot research vessel used for regional research.



NOAA Charleston and Hollings Marine Laboratories, Charleston, SC - These laboratories provide innovative and high quality research in areas such as harmful algal bloom (HAB) toxin detection and reference materials, coral health and disease, contaminant fate and effects, and deep coral ecology.



NOAA Beaufort Laboratory, Beaufort, NC - Opened in 1899, it is the second oldest federal marine laboratory and focuses on seagrasses, coral reefs, harmful algal blooms, seafloor mapping, aquaculture, and salt marsh ecology.



Kasitsna Bay Laboratory, Seldovia, AK - The Alaska field station for both NCCOS and the National Marine Fisheries Service since the late 1950s, the facility includes a 1,400 square-foot, running seawater lab to research coastal impacts of climate change, ocean acidification, harmful algal blooms, and monitoring of nearshore biodiversity.